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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/670,000	09/25/2000	James M. Holden	M-9455 US	3656

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EXAMINER

KAO, CHIH CHENG G

ART UNIT

PAPER NUMBER

2882

DATE MAILED: 03/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/670,000

Applicant(s)

HOLDEN ET AL.

Examiner

Chih-Cheng Glen Kao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3-16,27 and 28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 3-16,27 and 28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 September 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 16,19,20,21.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

Drawings

1. The proposed drawings filed 1/10/03 are acceptable; however, new corrected replacement drawings are still required in this application. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Claim Objections

2. Claim 7 is objected to because of the following informalities, which appear to be minor draft errors creating grammatical and lack of antecedent basis problems. In the following format (location of specific objection; respective suggestion), the following respective suggestions may obviate the objections: (claim 7, line 30, "said plurality of positions"; replacing "positions" with - -orientations- -) and (claim 7, line 32, "one wavelengths"; replacing "wavelengths" with - -wavelength- -).

For purposes of examination, the claims will be treated as such. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 3, 5, 9, 10, and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wack et al. (US Patent 6673637) in view of Reiley (US Patent 5519493) and Scheiner et al. (US Patent 6100985).

4. With regards to claims 3 and 13, Wack et al. discloses an apparatus (Fig. 3) and method comprising: a radiation source emitting broadband radiation (Fig. 3, #44, and col. 38, lines 4-15), a polarizing element (Fig. 3, #48), said radiation passing through the polarizing element toward a sample, said radiation being normally incident on and reflected off said sample (Fig. 3, #40), said reflected radiation passing through a polarizing element (Fig. 3, #52), at least one of the polarizing element and sample are rotatable (col. 38, line 33), and a spectrograph that detects the intensity at a plurality of polarization orientations (Fig. 3, #46 and 54, and col. 106, lines 40-44).

However, Wack et al. does not disclose reflected radiation passing through the said polarizing element, a computer system with at least one computer and program to extract spectral information, constructing an optical model, calculating spectral

information for the optical model, and curve fitting the calculated and extract spectral information to determine one or more parameters of a diffracting structure on a sample.

Reiley teaches reflected radiation passing through the said polarizing element (Fig. 1, #10 and 11, and Abstract). Scheiner et al. teaches a computer system with at least one computer and program (Fig. 2, #20) for extracting spectral information (Fig. 5A, #54), constructing an optical model (col. 11, lines 54-55), calculating spectral information for the optical model (Fig. 5A, #56), and curve fitting the calculated and extract spectral information to determine one or more parameters of a diffracting structure on a sample (Fig. 5A, #58, 60, and 62).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the apparatus of Wack et al. with the said polarizing element of Reiley, since one would be motivated to incorporate it to measure polarizations properties more quickly, accurately, and reliably (Abstract) as shown by Reiley.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the apparatus of Wack et al. with the computer program for analysis of Scheiner et al., since one would be motivated to incorporate it for providing a system that enables the relatively small amount of information representative of the structure's conditions to be obtained and successfully processed for even very complicated structures, as shown by Scheiner et al. (col. 2, lines 34-38).

5. With regards to claim 5, Wack et al. in view of Reiley and Scheiner et al. suggests an apparatus as recited above.

However, Wack et al. does not disclose curve fitting comprising comparing extracted and calculated spectral information, adjusting at least one variable parameter of the model, recalculating spectral information for the model, comparing the extracted and recalculated spectral information, and repeatably adjusting the at least one parameter, recalculating spectral information, and comparing the extracted and recalculated information until an acceptable fit is achieved.

Scheiner et al. further teaches curve fitting comprising comparing extracted and calculated spectral information (Fig. 5A, #58), adjusting at least one variable parameter of the model, recalculating spectral information for the model (Fig. 5A, #60), comparing the extracted and recalculated spectral information (Fig. 5A, #58), and repeatably adjusting the at least one parameter, recalculating spectral information, and comparing the extracted and recalculated information until an acceptable fit is achieved (Fig. 5A, #64).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to further modify the apparatus of Wack et al. with the computer program for analysis of Scheiner et al., since one would be motivated to incorporate it for providing a system that enables the relatively small amount of information representative of the structure's conditions to be obtained and successfully processed for even very complicated structures (col. 2, lines 34-38), as shown by Scheiner et al.

6. With regards to claim 9, Wack et al. further discloses a dispersing element (col. 79, line 33) and an array of detector pixels (Fig. 3, #46).
7. With regards to claims 10 and 15, Wack et al. further discloses a rotatable polarizing element (col. 38, line 33).
8. With regards to claim 14, Wack et al. further discloses a reference database (col. 43, lines 58-59).
9. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wack et al. in view of Reiley and Scheiner et al. as applied to claim 3 above, and further in view of Solomon et al. (US Patent 5900633).

Wack et al. in view of Reiley and Scheiner et al. suggests an apparatus as recited above.

However, Wack et al. does not disclose curve fitting using non-linear regression.

Solomon et al. teaches curve fitting using non-linear regression (col. 8, line 64, to col. 9, line 6).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the suggested apparatus of Wack et al. in view of Reiley and Scheiner et al. with the non-linear regression of Solomon et al., since one would be motivated to incorporate it to better find a best fit between the extracted and simulated

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parameters iteratively and automatically (col. 8, line 64, to col. 9, line 6) as shown by Solomon et al.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wack et al. in view of Reiley and Scheiner et al. as applied to claim 3 above, and further in view of Xu et al. (US Patent 5900633).

Wack et al. in view of Reiley and Scheiner et al. suggests an apparatus as recited above.

However, Wack et al. does not disclose using rigorous coupled-wave analysis for modeling.

Xu et al. teaches rigorous coupled-wave analysis for modeling (col. 7, lines 40-51).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the suggested apparatus of Wack et al. in view of Reiley and Scheiner et al. with rigorous coupled-wave analysis of Xu et al., since one would be motivated to incorporate it as a means for reducing computation time (col. 7, line 20, to col. 8, line 12) as implied by Xu et al.

11. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wack et al. in view of Reiley, Scheiner et al., and Motulsky (Analyzing Data with GraphPad Prism).

For purposes of being concise, Wack et al. in view of Reiley and Scheiner et al. suggests an apparatus as recited above.

However, Wack et al. does not disclose curve fitting with $R(\Theta) = A \cos^4(\phi - \Theta) + B \sin^4(\phi - \Theta) + C \cos^2(\phi - \Theta) \sin^2(\phi - \Theta)$, which is sum-of-squares with variables in non-linear regression.

Motulsky teaches curve fitting with sum-of-squares and variables in non-linear regression (Page 164-165).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the suggested apparatus of Wack et al. in view of Reiley and Scheiner et al. with the curve fitting of Motulsky, since one would be motivated to incorporate it for better interpreting information (Page 157) as implied from Motulsky.

12. Claims 11, 12, 16, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wack et al. in view of Reiley, Scheiner et al., and Kuni et al. (US Patent 4647196).

For purposes of being concise, Wack et al. in view of Reiley and Scheiner et al. suggests an apparatus and method as recited above.

However, Wack et al. does not disclose a rotating sample stage.

Kuni et al. teaches a rotating sample stage (col. 5, lines 34-38).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the suggested apparatus and method of Wack et al. in view of Reiley and Scheiner et al. with the rotating sample stage of Kuni et al., since

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one would be motivated to incorporate such a stage to move the sample to different areas for examination (col. 5, lines 34-38) as implied from Kuni et al.

Allowable Subject Matter

13. The indicated allowability of claims 7 and 8 is withdrawn in view of the newly discovered reference(s) to Motulsky. Rejections based on the newly cited reference(s) are as recited above.

Response to Arguments

14. Applicant's arguments with respect to claims 3-16, 27, and 28 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (571) 272-2492. The examiner can normally be reached on M-F 9-5.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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